The Influence of Lubricating Material on the Wear of Ball Bearings

65-58-4-5/12

oil were tested at temperatures of 10- 50°C. 5% of quartz dust (size = 20 - 30 mk) was added to the lubricant (Fig.5). The experiments were carried out for 5 hours at 1400 revolutions/minute, and the temperature of the lubricant = 20°C. Fig. 7. shows the decrease of ash formation of the oil in relation to the rate and duration of the wear of the ball bearing. It was found that the wear, at a given concentration and dispersion of the abrasive, is considerably lower when non-viscous lubricants (oils) are used than for viscous lubricants. This is due to the sedimentation of the abrasive particles in non-viscous oils. When viscous oils are used at increased temperatures, the abrasive wear depends on the dispersion and concentration of the abrasive in the lubricant, and on the friction caused by the abrasive granules during the movement of the bearings. There are 5 Figures and 5 References:- 1 English, 4 Russian.

1. Ball bearings-Lubrication 2. Ball bearings-Performance
3. Lubricating oils-Test results 4. Lubricating oils-Test methods 5. Lubricating oils-Testing equipment

Card 3/3

AUTHOR: Vinogradov, G. V. (Moscow) SOV/24-58-4-28/39

TITLE: On the Temperature Method of Evaluating the Lubrication Properties of Oils (O temperaturnom metode otsenki smazochnoy sposobnosti masel)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 4, pp 138-140 (USSR)

ABSTRACT: In recent years friction test machines with "point" contact surface of the rubbing pairs have been applied for evaluating the lubrication properties of oils, particularly 4-ball friction machines. In the IMASh AN SSSR Wear Resistance Laboratory a new method was evolved for evaluating the lubrication properties of oils on 4-ball instruments, which has been described in a number of papers published by Krushchov, M.M. and Matveyevskiy, R. M. (Refs 1-4). Now that R. M. Matveyevskiy (Ref 4) has published a monograph on that problem it is timely to subject it to an exhaustive critical evaluation. A general limitation of the method is the fact that this method enables determining the conditions of appearance of seizing but does not yield information on the process of its

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On the Temperature Method of Evaluating the Lubrication Properties of Oils

development, i.e. the intensity of its development, the ease or difficulty of stopping seizing, etc. This is due to the point of view that when seizing occurs there is a transition to dry friction of metals (Ref 4, pp 86 and 90) and only after intensive wear, which is accompanied by a drop in the specific pressure, "will the lubricant again gain access between the rubbing surfaces" (Ref 4, p 91). This is in reality not the case, as can be seen from data of Matveyevskiy entered in Fig 8 of his monograph. These data, which are in qualitative agreement with the observations of the author of this paper, show that the intensity of wear during seizing can vary greatly with the lubricating materials used. For certain low viscosity lubricants two critical seizing loads can be observed (Ref 8); a lower critical regime and a higher one, whereby the higher frequently ends up with a welding together of the rubbing surfaces. The best proof that seizing does not represent dry friction of metals is the here

On the Temperature Method of Evaluating the Lubrication Properties of Oils

quoted data of Matveyevskiy and those of Vinogradov et al. (Ref 7), from which it can be seen that the rate of wear during seizing is higher in presence of petroleum lubricants than in the case of dry friction. The method of determination of the limit lubricating capacity of oils is associated with the here mentioned assumption of occurrence of dry friction during seizing. The occurrence of seizing is evaluated on the basis of the magnitude of the friction coefficient and, according to Matveyevskiy, a correlation exists between the changes in the friction coefficient and the rate of wear on reaching critical temperatures. However, this correlation is a qualitative and not a quantitative one. The author of this critical note concludes that the temperature method of evaluation of the lubricating capacity of oils is interesting and promising but, at the present stage of its development, it does not exclude other variants of friction tests with machines with point contacts, including the method of evaluation of the anti-wear properties of lubricants from the

seizing loads, etc. The temperature method supplements in an interesting manner the results obtained on 4-ball friction machines at a number of variable test regimes (variation during the tests of the loads, the sliding speeds, the temperature, etc.); however, it will be necessary to carry out special tests on 4-ball test machines at variable friction regimes in order to substantiate the results obtained by this method. In view of the major difficulties of evaluating the lubrication properties of oils containing anti-seizing additives, it cannot be anticipated that the temperature method will solve this problem. A large number of specialists will have to spend more effort on developing further this temperature method of testing. Particularly, the Wear Laboratory of IMASh AN SSSR should intensify its efforts in this respect.

There are 15 references, 14 of which are Soviet, 1 English.

SUBMITTED: April 13, 1957

Card 4/4

SOV/65-58-8-6/14

AUTHORS: Tsurkan, I. G; Vinogradov, G. V; Pavlovskaya, N. T, and Morozova, O. Ye.

TITLE: Anti-Wear Properties of Oils from Eastern Petroleum. (Protivoiznosnyye svoystva masel iz vostochnykh neftey).

PERIODICAL: Khimiya i Tekhnologiya Topliv i Masel, 1958, Nr.8. pp. 29 - 34. (USSR).

ABSTRACT: During investigations on the useful characteristics of oils from Eastern petroleums, it was found that the anti-wear (lubricating properties) had not been studied sufficiently. Surface - and chemically active metals influence these properties to a very large degree. Investigations were based on results obtained by M. S. Borovaya on diesel oil fractions from Tuymazy, Binagadi, and Baku. These oils have similar viscosities, but different chemical composition (Table 1). Further tests were carried out on oils and intermediates obtained from the Novokuybyshevsk Petroleum Refinery. Characteristics of these products and their viscosities and sulphur-content are given in Table 2. Solutions containing sulphides and disulphides in the oils were tested. Fig.1: friction diagrams obtained from naphthenic-paraffinic fractions of the oil SU. These tests showed that the viscosity of the petroleum products from the Novokuy-

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Anti-Wear Properties of Oils From Eastern Petroleum.

byshevsk Petroleum Refinery only changed slightly during processing. Table 3: various methods used for evaluating the properties are compared. Fig.4: test results on the lubricating properties of structural-group composition of three diesel oils. These investigations showed that the medium viscosity products of Eastern petroleums have the highest effect. Fractions separated with the aid of isooctane show average properties. For all these aromatic products an almost horizontal line on the wear curves in the region of 60 - 70 to 90 kg loads is typical. The medium fraction, separated with isooctane, shows an optimum combination of chemically active sulphur compounds and viscosity. This investigation has made it possible to present a new method of evaluating the lubricating properties of the oils, to ascertain that during the processing of semi-goudron the lubricating property of the oily petroleum products decreases, and to find a limit in the lubricating properties of the

SOV/65-58-9-6/14

Anti-Wear Properties of Oils From Eastern Petroleum.

structural components of oils which may or may not contain sulphur compounds. There are 4 Figures, 2 Tables and 4 Soviet References.

ASSOCIATION: Institut nefti AN SSSR. (Petroleum Institute, AS USSR).

1. Oils--Test results

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SOV/65-58-11-11/15

AUTHORS: Sinitsyn, V. V; Gol'din, S. A; Vinogradov, G. V. and Sentyurikhina, L. N.

TITLE: Electronmicroscopic Investigations of the Structure of Consistent Greases Made From Synthetic Acids (Elektronmikroskopicheskoye issledovaniye struktury konsistentnykh smazok na sinteticheskikh kislotakh)

PERIODICAL: Khimiya i Tekhnologiya Topliv i Masel, 1958, Nr 11, pp 51 - 58 (USSR)

ABSTRACT: At present, lubricating oils and greases are made from synthetic acids which are prepared by the oxidation of paraffin. Their characteristics differ from those of lubricating oils made from edible oils, especially in their thixotropic properties, which is due to their different structures. A microscope EM-3 was used during the investigations on samples prepared according to the method described by G. V. Vinogradov (Ref.13). The samples were suspended in petroleum ether (1:200) and maintained in the solvent for a period varying from a few minutes to three months. In some cases benzene, toluene, carbon tetrachloride, dichloroethane and ethyl alcohol were used as solvents. Samples were heated to 55 - 85°C when lubricants were made from synthetic acids

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Electromicroscopic Investigations of the Structure of Consistent Greases Made From Synthetic Acids

containing a small amount of unsaponified matter. Anhydrous lithium and calcium lubricants (greases) and also commercial synthetic greases were tested. Lithium and calcium lubricants, made from individual fatty acids, were also prepared for comparative tests. A method was developed for investigating the structure of the suspension of individual hard hydrocarbons (paraffins) in organic solvents. White Drogobych paraffin with a melting point of 52°C was subjected to oxidation under laboratory conditions until the acid number equalled 70 mg KOH; this operation lasted 18 - 24 hours. The lithium lubricants were prepared from acid fractions of $C_{14}H_{28}O_2$ acids and from mixtures of $C_{16}H_{32}O_2$ and $C_{18}H_{36}O_2$ acids. The calcium lubricants were prepared from the same fractions and also from $C_{18}H_{36}O_2$ acids. Lithium fractions had a similar structure as commercial lubricants thickened with lithium stearate, and only differed from the latter by the degree of dispersion of needle-shaped soap crystallites which are formed in the dispersed phase (Figs. 1 and 2). The dispersed

Electronmicroscopic Investigations of the Structure of Consistent Greases Made From Synthetic Acids .

phase of calcium lubricants, thickened with soaps of synthetic acids (Figs. 3 - 5), is formed by laminar particles. Unsaponified substances influence the dimensions and forms of the original particles of the thickening agent. The flat band and laminar particles which form the structure of commercial synthetic greases (Fig.6) can be broken up easily by mechanical action. The low mechanical stability of synthetic greases is obviously influenced by the brittleness of the crystallites. The sharp difference in the structure of calcium lubricants made from synthetic acids and from edible oils explains the difference in their mechanical properties. It was also shown that anhydrous calcium lubricants, thickened with lithium stearate, have a similar structure as calcium lubricants for which synthetic acids with nearly equal molecular weight (the fraction $C_{18}H_{36}O_2$) have been used as thickening agents; the latter contained water but no unsaponified or polar compounds. A method is described for the electronmicro-

Electronmicroscopic Investigations of the Structure of Consistent Greases Made From Synthetic Acids

photography of microcrystallites of solid paraffins crystallized out from organic solvents. There are 9 Figures, 15 References: 11 Soviet, 1 French and 3 English.

Card 4/4

Anti-Wear Properties of Lubricants and the Influence of Various Factors on the Anti-Wear Properties of Petroleum Oils

alloy with 40% mercury, especially if containing 2% MoS_2 proved very effective lubricants at very heavy loads. The friction versus time curves for mercury and Wood's alloy lubrication of steel (Fig.3) and beryllium-bronze (Fig.4) spheres show that a considerable time is required for a steady state to be reached; the authors associate this with the removal of surface oxide films. They go on to deal with lubrication by petroleum oils. In their experiments the non-polar naphthene-paraffin fractions of a bright stock of mixed Surakhansk and Karachukhursk oils and of transformer oil were used. The kinetics of steel wear were studied at 50 and 150°C and sliding rates of 23 and 46 cm/sec and the effects of loading (Fig.5), one series (curve 6) being carried out above the critical load value. In view of the results obtained single-minute tests were adopted. These included tests in which various atmospheres (air, nitrogen, oxygen, argon and superheated steam) were provided and Fig.6 shows typical results for steel

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Anti-Wear Properties of Lubricants and the Influence of Various Factors on the Anti-Wear Properties of Petroleum Oils

critical temperature corresponding to the critical load. They deduce dimensionless equations and give results of experiments in which the information on the movement of the oil (required for applying the equations) was obtained by following the movement of ochre particles in the oil during a test. For treating the data the authors used an experimental relation between the friction coefficient and speed of sliding for sub-critical loads (Fig.8) and they show calculated and experimental values for the influence of the scaling factor, speed of sliding and friction coefficient on the critical loads (Fig.9 and table), the relations obtained being similar to those for gears (Ref.6). Fig.10 shows the results of the investigation of the temperature dependence of the critical load for various oils with 1/2" chromium ball-bearing steel balls. Metallographic study of sections cut slantwise through worn spots on the steel balls in the direction of sliding confirmed the expectation that at temperatures

Anti-Wear Properties of Lubricants and the Influence of Various Factors on the Anti-Wear Properties of Petroleum Oils

of the order of 200°C the nature of the atmosphere was the main factor. The authors maintain that in evaluating the lubricating properties of oils the nature of the wear process must be taken into account and briefly discuss this. There are 10 figures, 1 table and 8 references of which 7 are Soviet and 1 English.

SUBMITTED: 7th December 1957.

69-58-2 -22/23

AUTHORS: Vinogradov, G.V., Pavlov, V.P.

TITLE: The Problem of Fluidity and Stability of Structural Disperse Systems (K voprosu o tekuchesti i prochnosti strukturirovannykh dispersnykh sistem)

PERIODICAL: Kolloidnyy zhurnal, 1958, Vol XX, Nr 2, pp 248-253 (USSR)

ABSTRACT: This article contains a discussion on problems of modern rheology. The dependence of the shear stress on the deformation of bitumens which are highly viscous, weakly elastic, and structural disperse systems, is dealt with. Different methods give slightly difierent results. The elementary apparatus used for the investigations under discussion gives reliable results only for systems with low elastic deformations and may not always be applied to rheological processes taking place in highly elastic bodies. The juxtaposition of systems with large (aluminum naphthenate gels, etc.) and small (bitumens) elastic deformations must be met with great caution.

Card 1/2

69-58-2 -22/23

The Problem of Fluidity and Stability of Structural Disperse Systems

There are 4 graphs and 14 Soviet references.

SUBMITTED: July 12, 1957

1. Dispersion systems--Stability 2. Dispersion systems--Fluidity

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SOV-69-20-5-8/23

AUTHORS: Mdivnishvili, O.M., Vinogradov, G.V.

TITLE: A Rheological Study of the Structurized Suspensions of Bentonite and Some of its Derivatives (Reologicheskoye issledovaniye strukturirovannykh suspenziy askangelya i nekotorykh yego proizvodnykh)

PERIODICAL: Kolloidnyy zhurnal, 1958, Vol XX, Nr 5, pp 569-574 (USSR)

ABSTRACT: The mechanical properties of suspensions and pastes made from ascangel, a bentonite found in the Georgian SSR, are studied by means of an elastoviscometer [Ref. 4]. The ascangel suspensions were treated with solutions of NaCl, $CaCl_2$, $AlCl_3$, and monosubstituted Na-, Ca-, Al-bentonites, and mixed Na- and Ca-bentonites. The characteristics of the exchange complex of ascangel and its monosubstituted derivatives are given in a table. The limits of stability of the studied systems were determined as the highest values of the shear stress. The pastes of Ca- and Al-bentonites which were not subjected to preliminary mechanical destruction, are characterized by τ-curves with weakly pronounced maxima, which are inflexion points of the curves (Figure 1). The dependence of the limits of shear stability on the concentration of the suspensions and pastes is shown in Figure 2. The thixotropic structure formation

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A Rheological Study of the Structurized Suspensions of Bentonite and Some of its Derivatives

in water suspensions and pastes of bentonites was studied by destroying the suspensions and pastes in a field of homogeneous shear stresses in a rotary viscosimeter. The viscosity of the destroyed systems is dependent on the concentration. This dependence is represented by two intersecting curves. The point of intersection corresponds to the critical concentration of the disperse phase. There are 5 graphs, 1 table, and 6 references, 5 of which are Soviet and 1 English.

ASSOCIATION: Kavkazskiy institut mineral'nogo syr'ya (Caucasus Institute of Mineral Raw Material)

SUBMITTED: April 10, 1957

1. Bentonite--Mechanical properties

A Friction Machine for Testing the Lubrication Properties of Petroleum Products

loaded by a hydraulic arrangement containing a manometer of the type MT -1. The spindle oil AU is used. The measurement of the places of wear is carried out by means of a microscope MP-5. The reproducibility of the experimental results was investigated with a petroleum paraffin fraction of the oil MS-20 according to the one-minute method (Ref 3) at n=600 revs/min. There are 3 figures and 3 references, which are Soviet.

ASSOCIATION: Institut nefti Akademii nauk SSSR (Petroleum Institute AS USSR)

57-2-16/32

AUTHORS: Vinogradov, G. V. , Manin, V. N.

TITLE: An Investigation by Optical Polarization of the Flow Processes in Concentrated Solutions of High Polymers (Polyarizatsionno - -opticheskoye issledovaniye protsessov techeniya kontsentrirovannykh rastvorov vysokopolimerov)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol.28, Nr 2, pp.279-286 (USSR)

ABSTRACT: The peculiarities of the viscosity-, thixotropic- and dynamo-optical properties of a concentrated solution of ethylcellulose were compared here. The results in the determination of the extinction angle and the angles at double refraction well explain the nature of the thixotropic transformations in solutions of ethylcellulose. The quantitative dependence of the quantities of the double refraction and the extinction angles on the shearing strain and the velocity gradients is determined here. On the basis of a comparison of the rheological and the dynamooptical characteristics of systems which were investigated in a rotation-device with coaxial cylinders and a homogeneous poten-

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57-2-16/32

An Investigation by Optical Polarization of the Flow Processes in Concentrated Solutions of High Polymers

tial field, a method for the determination of the kinematics and the dynamics of the flows of anomalous viscous systems with a heterogeneous potential field is suggested here. For the case of a plane flow with a heterogeneous potential field the authors show a good convergence in the calculation of the kinematic and dynamic flow cross sections which were performed on the basis of the rheological and polarization-optical measurements. There are 6 figures, and 7 references, 6 of which are Slavic.

SUBMITTED: March 6, 1957

AVAILABLE: Library of Congress

1. Ethel cellulose-Viscosity

Card 2/2

The Elastic- and Strength-Properties of Plastic Dispersed Systems in Connection With the Phenomenon of Thixotropy

the revolution of the dynamometer core, an increase in g is observed because of the thixotropic restoration of the lubricant structure. Even for $n \sim 10^{-5}$ revolutions per minute, the values of g were by 10 % lower than the corresponding values found under static conditions. The coefficient of shear g and the shear strength τ_{str} depend differently on the deformation of plastic bodies. The elasticity- and the shear-strength are caused by different kinds of bonds between the particles of the dispersed phase. There are 4 figures and 4 references, 4 of which are Soviet.

PRESENTED: May 17, 1957, by A. V. Topchiyev, Academician

SUBMITTED: May 17, 1957

VINOGRADOV, G. V., (SECTION V)

"Rheology of Lubricants and Oils."

Report submitted at the Fifth World Petroleum Congress, 30 May - 5 June 1959. New York.

DEYNEGA, Yu. F.; DUMANSKIY, A. V.; VINOGRADOV, G. V.; NEYMARK, I. Ye.

"The Effect of the Surface and its Modification on the Dielectric Properties of Some Disperse Systems."

report presented at the Section on Colloid Chemistry, VIII Mendeleyev Conference of General and Applied Chemistry, Moscow, 16-23 March 1959.
(Koll. Zhur. v. 21, No. 4, pp. 509-511)

PAKSHVER, E.A.; GELLER, B.E.; VINOGRADOV, G.V.

Studying the concentrated solutions of polyacrylonitrile in dimethylformamide. Khim. volok. no.2:21-24 '59. (MIRA 12:9)

1.Vsesoyuznyy nauchno-issledovatel'skiy institut iskusstvennogo volokna.

(Acrylonitrile) (Formamide)

SOV/179-59-2-18/40

AUTHORS: Vinogradov, G.V. and Pavlov, V.P. (Moscow)

TITLE: Elastic and Strength Properties of Soft Bodies (Uprugiye i prochnostnyye svoystva myagkikh tel)

PERIODICAL: Izvestiya Akademii nauk SSSR OTN, Mekhanika i mashinostroyeniye, 1959, Nr 2, pp 134-141 (USSR)

ABSTRACT: The paper consists of material delivered to the Third World Congress on Rheology, September 1958. Experiments were carried out in a rotational elasto-viscometer with concentric cylinders, the space between which was filled with the material under investigation. In some experiments, the inner cylinder was fluted, but in others it was plain. The speed of rotation could be varied from 4×10^{-7} to 1.5×10^{3} rpm. The deformation was recorded automatically by means of an optical magnification device. The rotation could be started and stopped almost instantaneously, thus permitting the stress relaxation properties to be determined. The stress/deformation/time curves are given for a grease and for pastes of bentonite in water, and deformation/velocity/time curves for the grease. The dependence of shear modulus and limiting shear strength on the deformation velocity is

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Elastic and Strength Properties of Soft Bodies

also shown for the two materials. The limiting shear strength is determined from the maxima in the stress/deformation curve and occurs at deformations amounting to about 10%. Some lowering of the shear modulus, accompanied by breakdown in the material, occurs above the limiting shear strength. There are 6 figures and 7 Soviet references.

SUBMITTED: December 18, 1958.

SOV/69-21-2-14/22

5(

AUTHORS: Mamakov, A.A., Tyabin, N.V., Vinogradov, G.V.

TITLE: The Application of the Similarity Theory in Calculating the Flowing Processes of Plastic Lubricants in Tubes (Primenenie teorii podobiya k raschetu protsessov techeniya plastichnykh smazok v trubakh)

PERIODICAL: Kolloidnyy zhurnal, 1959, Nr 2, pp 208-215 (USSR)

ABSTRACT: The authors propose two methods of generalizing experimental data, and the calculation of the flow of plastic lubricants in tubes in the form of a dependency of the tube resistance coefficient on the generalized Reynolds criterium. The variable effective viscosity method consists in the determination of the generalized Reynolds criterium according to the value of the local effective viscosity for the layer contiguous to the tube wall. The constant parameter method consists in the approximation of the flow curve in the form of straight lines corresponding to the equations Shvedov-Bingham and in the determination of the generalized Reynolds criterium according to the parameters of the viscous-plastic

Card 1/2

The Application of the Similarity Theory in Calculating the Flowing Processes of Plastic Lubricants in Tubes

flow. The application of these methods permitted a generalization of experimental data concerning the flow of plastic lubricants in tubes at a change of the speed gradient from 0.03 to 35,400 sec.$^{-1}$, the length of the tubes by 250 times and their diameters by 36 times. The authors have found an expression of the tube resistance coefficient from the generalized Reynolds formula at the flow of plastic lubricants, and have shown that for the calculation of loss of pressure, the usual hydraulic calculation methods can be used. These are based on the method of approximating curves of the flow of plastic lubricants in rotary viscosimeters. The authors mention the following Soviet scientists: G.V. Vinogradov, V.P. Pavlov, V.G.Petrovskiy, N.V. Tyabin. There are 5 graphs and 21 references, 12 of which are Soviet and 9 English.

ASSOCIATION: Khimiko-tekhnologicheskiy institut im. S.M. Kirova, Kazan' (Chemical-Technological Institute imeni S.M. Kirov, Kazan')

SUBMITTED: May 6, 1958

Card 2/2

S/179/59/000/06/014/029
E081/E141

AUTHORS: Vin[illegible], [illegible], Lamakov, A.A., and Pavlov, V.P.
(Mos[illegible])

TITLE: Exper[illegible] Investigation of an Anomalously Viscous Body [illegible] Stress Condition

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, [illegible] i mashinostroyeniye, 1959, Nr 6, pp [illegible] (USSR)

ABSTRACT: The paper is a continuation of previous work (Refs 1,2,3). The experiments were carried out on a lubricant grease containing [illegible].2% spindle oil, 12% calcium soap of cotton seed oil [illegible] 1.6% water. For comparison, measurements were also carried out on a high-resin extract of the waste [illegible] oil processing, which is a high viscosity [illegible] with Newtonian flow characteristics. The [illegible] were made in a double rotation viscometer, (Fig [illegible]). [illegible] hydraulic fluid supplied from an apparatus of constant [illegible] delivery passed to the tube 1 with precision manometer [illegible] to the viscometric cylinder 3 where it exerted [illegible] on the piston 4. The test material 5 filled [illegible] cylinder 3 and was forced by the piston 4 into the tube [illegible] flexible hose 7 and the space between the

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S/129/59/000/06/014/029
E081/E141

Experimental Inv... of an Anomalously Viscous Body in a Complex Stress ...

...thermal cylinders of one of the viscometers ...rotation apparatus 8, 9. The internal ...e rotation viscometer was driven by ...hydraulic motor. The hydraulic drive ...a hydraulic motor, hydraulic pump and oil ...llowed continuous regulation of the ...from 0.55 to 1500 rev/min controlled by ...disc 10. The moment of resistance was ...equipment 11-14, working on a ...bod. The force created by the weight 11 ...by the flexible cord 12 and pulley 13 to ...linder, and compensated for the resistance ...rial in the space between the lateral ...cylinders. The load 11 was chosen so ...l cylinder of the rotation viscometer ...ry as indicated by the zero pointer 14. ...were contained in a thermostat 15, ... The two coaxial viscometers were ...for the length of the rotating cylinder, ...measurements in both, end effects were

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S/179/59/000/06/014/029
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Experimental Investigation of an Anomalously Viscous Body in a Complex Stress Condition

eliminated. The twisting moment was measured as a function of rotation velocity, and at the same time an axial flow, varying between 1.48 x 10-3 and 1.82 cm3/sec was maintained through the viscometer. Control experiments on the circumferential flow were carried out in the rotation plasto-viscometer PVR-1 (Ref 3). The system is analysed mathematically and expressions obtained for the mean axial deformational velocity, D_{10}, the circumferential deformational velocity, D_2, and the deformational velocity at the wall, D_1 (Eqs 1 and the two preceding equations). Graphs are given of log D_{10}, log D_1 and log D_2 against log r_1 and log r_2 at temperatures of 20, 35 and 500 (Figs 2, 3, 4); r_2 and r_1 are respectively the mean and the axial tangential stresses. Examination of the curves for the grease for the high resin extract and for the grease preconditioned at a deformation velocity of 5.1×10^4 sec^{-1} in a rotary homogeniser shows that the axial and circumferential flow have essentially the same characteristics. If the two flows are of the same order of magnitude, there is a strong

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Experimental Investigation of an Anomalously Viscous Body in a Complex Stress Condition

influence of circumferential on axial flow. At low circumferential flows, there is practically no influence on axial flow. At high circumferential velocities, the axial flow of the anomalously viscous body becomes Newtonian. Some increase in circumferential viscosity is observed at high axial velocities. This effect diminishes if the temperature is raised, and also if the body is preconditioned by subjecting it to high deformational velocities. Figure legends are as follows. Fig 1 - Schematic arrangement of the apparatus for investigating flow of an anomalously viscous body under the action of two simple shears. Fig 2 - characteristic (continuous) and neutralised (dotted) flow curves for extract. Fig 3 - characteristic (continuous, dashed) and neutralised (dotted) flow curves for fatty grease. Fig 4 - characteristic (continuous) and neutralised (dotted) flow curves for fatty grease, the structure of which was broken down in a homogeniser at a deformation velocity $D = 5.1 \times 10^4$ sec-1. (In Figs 2-4 the dotted lines represent the curves $D_{10}(\tau_1)$ obtained for extract and

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S/179/59/000/06/014/029
E081/E141

Experimental Investigation of an Anomalously Viscous Body in a Complex Stress Condition

grease with axial flow in the gap of the twin rotation viscometers. The continuous lines represent the curves $D_2(\tau_2)$ obtained with circumferential flow of the extract in the twin rotation viscometers, and in the plasto-viscometer PVR-1. The units of shear are dynes/cm^2 and of deformation velocity sec^{-1}. The numbered points on the curves are identified in the table at the top of page 104, in which Q = axial discharge).
Fig 5 - dependence of effective axial viscosity on circumferential deformation velocity for extract.
Fig 6 - curves of change of effective axial viscosity with circumferential deformation velocity for fatty grease at temperatures of 80, 65 and 20°. Fig 7 - curves of change of effective circumferential viscosity on circumferential deformation velocity (viscosity (sic)) for grease.
There are 7 figures, 1 table and 6 references, of which 5 are Soviet and 1 is English.

Card 5/5

SUBMITTED: June 4, 1959

MAMAKOV, A.A.; TYABIN, N.V.; VINOGRADOV, G.V.

Graphical method for determining the distribution of flow velocities of elastic petroleum products. Izv. vys. ucheb. zav.; neft' i gaz 2 no.7:81-86 '59. (MIRA 12:12)

1.Kazanskiy khimiko-tekhnologicheskiy institut im. S.M. Kirova.
(Hydraulics)

TSURKAN, I.G.; VINOGRADOV, G.V.

New four-ball friction machine for evaluating the wear-resistant properties of lubricating oils. Zav.lab. no.11:1394-1396 '59. (MIRA 13:4)

1.Institut neftekhimicheskogo sinteza Akademii nauk SSSR.
(Lubrication and lubricants-- Testing)

SOV/80-32-5-36/52

5(3)

AUTHORS: Vinogradov, G.V., Kusakov, M.M., Sanin, P.I., Razumovskaya, E.A., Ul'yanova, A.V.

TITLE: The Interaction of Thioorganic and Thiophosphoroorganic Additions to Oils With Metals

PERIODICAL: Zhurnal prikladnoy khimii, 1959, Vol 32, Nr 5, pp 1136-1141 (USSR)

ABSTRACT: Anti-wear admixtures to oils containing sulfur-, phosphorus- and chlorine-compounds are widely applied. The functional limits of their action is investigated here by means of labeled atoms. They were dissolved in the non-polar fraction of bright stock and their interaction with chromium-manganese-silicon steel and electrolytic copper was studied. The interaction of steel with sulfur starts already at room temperature. The reaction of sulfur with copper is more intense. The reactivity of disulfide is higher than that of sulfide due to the higher mobility of the sulfur atoms in the disulfide molecule. The sulfur is bound to steel and copper irreversibly, i.e. chemically. Experiments with tributyltrithiophosphite labeled by P^{32} and S^{35} have shown that phosphorus reacts more intensively with steel than sulfur. At 20°C it is bound in the amount of 4.2 mg/cm^2. At 140°C and higher the decomposition of tributyltri-

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The Interaction of Thioorganic and Thiophosphoroorganic Additions to Oils With Metals

thiophosphite starts which may be regarded as the upper limit of the protective action. A film of iron phosphide is more easily formed on steel than a sulfide film. At a temperature increase sulfur reacts more intensively with copper than with steel.
There are 5 graphs, 1 table and 6 references, 5 of which are Soviet and 1 American.

SUBMITTED: January 22, 1958

SOV/20-125-5-30/61

5(4), 10(4)

AUTHORS: Pavlov, V. P., Vinogradov, G. V.

TITLE: The Thermal Effect During the Motion and the Stoppage of a Flow of Anomalously Viscous Bodies (Teplovyye effekty pri techenii i ostanovke potoka anomal'no vyazkikh tel)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 5, pp 1061 - 1064 (USSR)

ABSTRACT: The processes of heat liberation in a flow are best investigated in the case of high homogeneity of the field of shearing stresses. In the present paper the thermal effects were therefore investigated by means of a rotation viscosimeter already previously described (Ref 3). The operational surfaces of the cylinder were ground. The temperature increase (ΔT) in the flow was determined with an accuracy of up to $\pm 0.005^{\circ}$ by means of a differential thermocouple. The time dependence of ΔT was recorded on photographic paper by means of a mirror galvanometer and a photographic camera. A typical photograph illustrates the results obtained by experiments carried out with Newton liquids. Temperature in-

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creases until it becomes steady. After this is attained, the entire energy supplied is transferred to the thermostate in form of heat and ΔT=const holds. Next, temperature variation in the flow is investigated by analysis. The entire specific power input N_{sp} is assumed to be transformed into heat. One part of this power is used for heating the substance under investigation, the other is conveyed to the thermostat. The heat balance of the process may be expressed by the equation

$$D = c \frac{d(\Delta T)}{dt} + k \cdot \Delta T .$$

Here c denotes the specific heat of the subject under investigation (referred to the volume), and k - the coefficient of the heat transfer from this substance to the liquid in the thermostat. Herefrom it follows for the slowing down of the flow that

$$c \frac{d(\Delta T)}{dt} + k_1 \Delta T = 0.$$

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By integration of this equation

$$c \Delta T_s = -k \int_{t_0}^{t_1} \dot{\gamma} \tau dt = kmS_1 = E_1$$

is obtained, where m denotes a proportional factor. For the purpose of determining the coefficient k the authors investigated the dependence of ΔT_s on $D^{\cdot}$. The test objects used were Newton liquids (petroleum), plastic dispersive systems of the type of consistent lubricants, concentrated solutions of ethyl cellulose and aluminum naphthenate in some solvents, as well as other substances. It was confirmed that the equation $D^{\cdot} = k \Delta T_s$ holds and that k does not depend on $D^{\cdot}$ and the rheological properties of the substances to be investigated. Next, the phenomena accompanying slowing down of a flow of highly complicated structural systems is investigated. A diagram gives data concerning the time dependence of the integral and differential thermal effects, which are typical

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of such substances, after a sudden stoppage of flow. The authors thank Academician V. A. Kargin for discussing this paper and for his valuable advice. There are 3 figures, 1 table, and 3 Soviet references.

ASSOCIATION: Institut neftekhimicheskogo sintcza Akademii nauk SSSR (Institute for Petroleum-Chemical Syntheses of the Academy of Sciences, USSR)

PRESENTED: January 5, 1959, by V. A. Kargin, Academician

SUBMITTED: December 17, 1958

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SOV/20-127-2-35/70

5(4)
AUTHORS: Vinogradov, G. V., Mamakov, A. A., Pavlov, V. P.

TITLE: The Flow of Anomalous Viscous Systems Under the Action of Two Pure Shearing Stresses in Mutually Perpendicular Directions

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 2, pp 362-365 (USSR)

ABSTRACT: In the clearance between two coaxial cylinders, both an axial and a radial flow are possible. Thus, the possibility is given of comparing different forms of flow of anomalous viscous systems under different shearing stresses and at different velocity gradients in one and the same apparatus. Grease-"solidol" consisting of 86.2% spindle oil, 12% Ca-soaps of cottonseed oil, and 1.8% water, was the material used for the experiments. A high-viscosity Newton liquid, an extract of resins and polycyclic aromatic hydrocarbons from petroleum-distillation residues, served as control liquid. The measurement was made in a system with two rotary viscosimeters with coaxial cylinders, differing by the size of the cylinders' working surfaces. Concerning the shearing stress for axial flow it holds according to references 3 - 5 :

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$\tau_{ax} = \Delta p \frac{H}{2L}$ (Δp = pressure drop per unit of length of the cleft in axial direction, H = cleft width, L = length of cylinder surface). For the velocity gradient it holds:

$\bar{D}_{ax} = Q(2\pi RH^2)^{-1}$ (Q = amount of flow, R = radius of the inner cylinder). Checking revealed that the method applied yielded well reproducible results. Experimental results with "solidol" are shown in logarithmic coordinates in figure 1. Table 1 contains the values for $\bar{D}_{ax}$. With simultaneous axial and radial flow, Δp and the moments of resistance are measured at different D_{rad} (Fig 2). Curves 1 show the flow in the case of a purely axial flow ($D_{rad} = 0$), curves 2 - 7 show the dependence $\bar{D}_{ax}(\tau_{ax})$ for given D_{rad}. In the case of a homogeneous shearing stress field all over the clearance, the radial flow brings out a destruction of the structure and transforms the plastic body into an anomalous-viscous liquid.

The higher D_{rad}, the lower becomes viscosity. Hence, at given D_{ax} with rising D_{rad} the shearing stress τ_{ax} drops, whereas at given τ_{ax} with rising D_{rad} also D_{ax} increases strongly. In the case of a radial flow the plastic systems were found capable of flowing out axially under the action of much lower pressures, as compared to the absence of a radial flow. A remarkable fact is that in the case of low τ_{ax} there is a direct proportionality between D_{ax} and τ_{ax}. If D_{ax} is very large as compared to D_{rad}, and assuming high temperatures, the effect of the radial flow becomes unimportant. The effect of the axial flow on the radial is shown in figure 3. Figure 4 depicts the superposition of τ_{rad} and τ_{ax}.

In the case of a combined shear the flow curves lie in a fork which is formed by the curves of the purely radial and

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purely axial flow. The authors thank Academician V. A. Kargin for advice. There are 4 figures, 1 table, and 7 references, 6 of which are Soviet.

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR (Institute of Petroleum-chemical Synthesis of the Academy of Sciences, USSR)

PRESENTED: March 2, 1959, by V. A. Kargin, Academician

SUBMITTED: March 21, 1959 (sic)

Card 4/4

GUT'YAR, Ye.M., prof., doktor tekhn.nauk; otv.red.; D'YACHKOV, A.K., prof., doktor tekhn.nauk, otv.red.; VINOGRADOV, G.V., prof., doktor khim.nauk, otv.red.; KLEBANOV, M.Ya., red.izd-va; GUS'KOVA, O.M., tekhn.red.

[Hydrodynamic theory of lubrication. Sliding supports. Lubrication and lubricants] Gidrodinamicheskaia teoriia smazki. Opory skol'zheniia. Smazka i smazochnye materialy. Moskva, Izd-vo Akad.nauk SSSR, 1960. 422 p. (Trudy Vsesoiuznoi konferentsii po treniiu i iznosu v mashinakh, no.3) (MIRA 14:1)

1. Vsesoyuznaya konferentsiya po treniyu i iznosu v mashinakh. 3d, 1958.
(Lubrication and lubricants) (Rheology)

VINOGRADOV, G.V.

report presented at the 1st All-Union Congress of Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb '60.

35. B. M. Borodachev (Kuibyshev): On the solution of the dynamic contact problem for a half-space under conditions of axial symmetry.

36. J. Brilla (Bratislava). Anisotropic plates with discontinuous supports.

37. B. M. Bryzgalo (Moscow): On the essential non-linearity of certain problems on column stability.

38. [illegible] (Kiev), [illegible] (Moscow): On the determination of safety factors under alternating random loads.

39. A. V. Burlakov (Kharkov): An experimental investigation of creep of turbine diaphragm models.

40. B. P. Burmistrov (Saratov): On the stability of constructionally anisotropic circular ring plates.

41. [illegible], V. Petcu, S. Rautu (Bucharest): The field of application of [illegible]plasticity.

42. D. V. Vainberg (Kiev): The state of stress of lamellar systems of regular configuration.

43. V. V. Vainshtok (Moscow): Thixotropic properties of lubricants as basis of their rheological characteristics.

44. G. A. Van-Fo-Fi, G. N. Savin (Kiev): Application of Mathieu functions to the investigation of shells.

45. V. M. Varvak (Kiev): Determination of stresses and deformations in massive bodies.

46. [illegible] (Gorkii): The flow of bitumens and filled bitumens in pipes.

47. I. N. Vekua, V. I. Mushkhelishvili (Tbilisi): Applications of analytic functions in the theory of elasticity.

48. [illegible] (Tbilisi), V. V. [illegible] (Erevan): Experimental investigation of the behavior of eccentrically compressed short columns for long loading times.

49. G. V. Vinogradov (Moscow), A. A. [illegible] (Kazan), V. P. Pavlov (Moscow): Investigation of soft plastic bodies under combined states of stress.

50. G. V. Vinogradov, V. P. Pavlov (Moscow): Basic peculiarities of the [illegible] properties of plastic lubricants.

51. [illegible] (Leningrad): Fundamentals of the linear theory of visco-elastic impact.

52. [illegible] (Kharkov): The solution of dynamic contact problems for foundations using a simplified model.

53. [illegible] (Moscow): On the equilibrium equations of thick elastic plates.

54. [illegible] (Lakutsk): The creep of ice and frozen soils under combined stresses.

55. M. P. Volarovich, [illegible], [illegible] (Moscow): Studies of viscoelastic properties of porous bodies (e.g. peat) by the ultrasonic pulse method.

56. M. P. Volarovich (Moscow), [illegible] (Minsk): The plane flow of a visco-plastic medium between two planes forming an acute angle.

57. M. P. Volarovich, [illegible] (Moscow): Kinematics and dynamics of the flow of visco-plastic dispersed media past bodies of different shapes.

58. A. S. Vol'mir (Moscow): On the analysis of a short closed cylindrical shell.

59. [illegible], [illegible] (Sverdlovsk): On the distribution of elastic constants in quasi-isotropic polycrystalline media.

60. [illegible] (Rostov-na-Donu): A statistical method in the stability theory of shells.

61. [illegible] (Rostov-na-Donu), [illegible] ([illegible]): On stress concentration in a plane with an infinite number of holes.

62. [illegible] (Leningrad): Foundations of the general engineering theory of elastic beams.

63. S. S. Vialov (Moscow): The laws of deformation of ice.

64. S. S. Vialov (Moscow): The laws of motion of ice crusts and the theory of visco-plastic flow based on research in the Antarctic.

65. [illegible] (Leningrad): A method of obtaining polynomial stress and displacement functions.

66. [illegible] (Kazan): A contribution to the theory of the finite deformations of thin shells.

67. [illegible] (Moscow): The propagation of elastic-plastic bending and shear waves in the axisymmetrical deformations of shells.

VINOGRADOV, G. V.

"Fundamentals of extreme pressure lubrication."

report to be submitted at Gordon Research Conferences - New London, New Hampton, and Meriden, N.H., 13 June-2 Sep 60.

Institute of Petroleum, USSR Academy of Sciences.

S/183/60/000/02/14/025
B004/B005

AUTHORS: Koretskaya, A. I., Konstantinov, A. A., Vinogradov, G. V.

TITLE: An Apparatus for Determining the Viscosity of Polyamide Resin Melts

PERIODICAL: Khimicheskiye volokna, 1960, No. 2, pp. 36 - 39

TEXT: The authors describe a variation of the recording viscosimeter of the type AKV-2. Because of the high viscosity of polyamide resin melts, discharge is not through a capillary tube but through a concentric slit. The melt is pressed through the slit by means of a spring-loaded piston. To prevent oxidation, the viscosimeter is filled with nitrogen. Fig. 1 shows a diagram of the apparatus, Fig. 2 the component parts made of stainless steel, and Fig. 3 a total view. Figs. 4 and 5 show experimental results obtained with caprone resin in the form of graphs. There are 5 figures and 10 references, 5 of which are Soviet.

ASSOCIATION: VNIIV (All-Union Scientific Research Institute of Synthetic Fibers)
Koretskaya, A. I.; Institut neftekhimicheskogo sinteza AN SSSR
(Institute of Petroleum-chemical Synthesis of the AS USSR)
Konstantinov, A. A., Vinogradov, G. V.

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VINOGRADOV, G.V.; MANIN, V.N.

Rheological properites of concentrated polymer solutions. (MIRA 13:11)
Vysokom. soed. 2 no. 3:329-336 Mr '60.

1. Institut neftekhimicheskogo sinteza AN SSSR.
(Polymers) (Cellulose)

86144

S/152/60/000/002/001/002
B023/B060

15.6000

AUTHORS: Bezborod'ko, M. D., Vinogradov, G. V., and Paylov, V. P.

TITLE: Effect of Lubricants and Anti-wear Additives Upon the Abrasion Wear of Metals in Sliding Friction

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Neft' i gaz, 1960, No. 2, pp. 73-79

TEXT: The authors wanted to clarify the effect of lubricants and anti-wear agents upon the abrasion wear of metals in sliding friction. Tests were conducted on a four-ball friction machine (Ref. 6) with balls 12.7 mm in diameter made of ШХ6 (ShKh6) steel and Х18 (Kh18) stainless steel. The steel hardness was 832 kg/mm^2 and 657 kg/mm^2, respectively. The rubbing speed was 21 cm/sec. ШХ6 (ShKh6) steel balls 9.52 mm in diameter were tested with V. P. Pavlov's sliding machine (Ref. 7). The sliding rate in this case amounted to 41.5 cm/sec. The tests were conducted at room temperature by the "one-minute" method. The balls were first subjected to stress, and the machine was then started. The abrasive agents used were electrocorundum micropowders М7(M7), М10(M10), М14(M14), and М28 (M28),

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and boron carbide micropowders M3(M3), M5(M5), and M7(M7), produced at the Petergofskiy chasovoy zavod (Petergof Watch Factory). The size of the micropowder particles conformed with ГОСТ 3258-46 (GOST 3258-46), and in the case of electrocorundum particles it was correspondingly 7-5, 10-7, 14-10, and 28-20μ. The boron carbide particles were correspondingly 3-5, 5-3, 7-5μ large. The mentioned micropowders contained 60-70% main fraction. Mica or silica gel of at most 14μ were introduced in some of the tests. The micropowders were all added to the lubricants while stirring. The lubricants used were mixtures of plastic lubricants with oils of medium viscosity or with naphthene-paraffin fractions. АУ (AU) and МС-14 (MS-14) oils were used as the liquid hydrocarbon media. Dibenzyl sulfide as an anti-wear substance was added to the mixtures in an amount of 2.46 percent by weight. The results obtained by the authors from their tests are in agreement with observed wear resistance of the sulfidized rubbing surface in the presence of abrasives (Ref. 7). It may be seen from Fig. 4 that in all cases the introduction of dibenzyl sulfide reduces friction in the gripping period. The authors were able to establish that the specific effect of the abrasive in the lubricants is to a large extent dependent

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both upon the nature of the metal forming the body subjected to friction and on the composition of the lubricants. As the friction coefficients increase in the presence of abrasives, the anti-wear effect of sulfur compounds also increases. In other words, plastic sulfides are formed by the sulfur compounds on the friction area with gripping of the latter, whereby the real contact area of friction is increased, which in its turn causes a reduction in the intensity of the initial gripping process. There are 4 figures and 9 references: 7 Soviet and 2 US.

ASSOCIATION: Voyennaya ordena Lenina akademiya bronetankovykh voysk im. I. V. Stalina (Military "Order of Lenin" Academy of Armored Tank Troops imeni I. V. Stalin)

SUBMITTED: August 6, 1959

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S/152/60/000/003/003/003
B023/B060

AUTHORS: Vinogradov, G. V., Mamakov, A. A., Pavlov, V. P.

TITLE: Homogenization and Rheological Properties of Plastic (Consistent) Lubricants

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Neft' i gaz, 1960, No. 3, pp. 81-88

TEXT: The first author has pointed out in a previous paper that the majority of industrial lubricants are micrograined systems (Ref. 1). In the study under consideration, the authors set themselves the following tasks: 1) to work out a colloid mill, where lubricants can be subjected to an intense homogenation under rigorously defined conditions; 2) to study the rheological properties of typical industrial lubricants. The test objects were lubricant 201 (ГОСТ 6267-52)(GOST 6267-52) and grease УС$_{c}$-2 (US$_{s}$-2) ГОСТ 4366-50 (GOST 4366-50). The rheological properties of fresh and homogenized lubricants were intercompared. The determination was carried out by a plastoviscosimeter (Ref. 8). The temperature was 20 ± 1°. Fig. 1 shows the scheme and the construction of the homogenizer which is

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Homogenization and Rheological Properties of Plastic (Consistent) Lubricants

thoroughly described along with the working principle. Homogenation was performed with an axial feed of lubricant of $2.5 \cdot 10^{-3}$ cm^3/sec and a deformation rate of $5.25 \cdot 10^5$ (lubricant 201) and $3.27 \cdot 10^5$ (synthetic grease). Phenomena of hysteresis are observed to be common to all fresh (non-homogenized) lubricants in the study of viscosity, the deformation rate varying considerably. Successive increase and decrease of the deformation rate leads in graphical representation to noncoinciding flow curves. The study of homogenized lubricants revealed two types. To the first belongs lubricant 201. Lubricants of this type are intensively destroyed under the action of high deformation rates. Their rheological properties are changed irreversibly. The results obtained from the study of the viscosity of lubricant 201 are in agreement with the determination of the limit values of durability (Table 1), which do not change after the lubricant has been allowed to "rest", either. Lubricants of the 201 type distinguish themselves especially by their microcraininess. When subjected to an intense homogenation they excel by stable, rheological properties which do not change with time and are not affected by mechanical actions, provided the intensity of such actions is lower than that of homogenation. The synthetic grease US_3-2 belongs to the second type. Here

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one may observe, besides irreversible changes, also such of lubricant properties with time. In addition, also phenomena of hysteresis appear here after an intense mechanical action. The principal characteristic is, however, that these lubricants, when intensively homogenized, may be regarded as Newton's liquids. The viscosity of these lubricants does not depend upon the length of the "resting" period. Table 1 shows the change of the limit values of durability for both types with time. The differences between the lubricants of the first and the second type are interrelated with the differences in the structure of the disperse phase. The decisive factor, however, is the coarse-grained structure of the 201 lubricant. This structure accounts for the irreversibility of the changes of rheological properties. The inability of grease US_8-2 to restore its rheological properties after "resting" is to be explained by the fact that particles of the disperse phase of a colloidal dimension are present in grease. There are 3 figures, 2 tables, and 9 Soviet references.

ASSOCIATION: Kazanskiy khimiko-tekhnologicheskiy institut im. S.M. Kirova (Kazan' Institute of Chemical Technology imeni S. M. Kirov)

Homogenization and Rheological Properties of Plastic (Consistent) Lubricants

S/152/60/000/003/003/003
B023/B060

SUBMITTED: July 28, 1959

Card 4/4

VINOGRADOV, G V.

S/179/60/000/02/009/032
E081/E241

AUTHORS: Vinogradov, G. V., Mamakov, A. A., and Tyabin, N. V. (Moscow)

TITLE: Flow of Anomalously Viscous Bodies Under Complex Stress Conditions

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk Mekhanika i mashinostroyeniye, 1960, Nr 2, pp 65-69 (USSR)

ABSTRACT: A continuation of previous work (Refs 5, 6, and 7). Data are given of experimental investigations into the flow of a residual extract (highly viscous Newtonian fluid) and a lubricant grease (anomalously viscous body) to verify the generalized flow law under the combined action of two simple shears. The data were obtained by simultaneous measurements with a double rotation viscometer (Ref 6) and a capillary viscometer with constant outflow (Ref 7). The methods and basic experimental results are given in Ref 5. Complex shear conditions were realised by the combined action on the body contained in the space between two cylinders, of an external pressure and a twisting moment, the latter being obtained by rotation of the outer cylinder. In this way, axial

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and circumferential flow are superimposed and the particles of the anomalously viscous body move in screw trajectories ab (Fig 1: Scheme of screw flow of grease in a narrow annular space). The generalized equation of flow is written in the form (1) (Ref 8), and in cylindrical co-ordinates r, φ, z, the quantities p_i and $\dot{e}_i$ are written in the forms (2) and (3). (The dot over $\dot{e}_i$ denotes differentiation with respect to time). p_i is the intensity of shear stress, $\dot{e}_i$ the intensity of deformation velocity, η_i the effective viscosity coefficient, p_{rr}, $p_{\varphi\varphi}$, p_{zz} are normal stresses, $\dot{e}_{rr}$, $\dot{e}_{\varphi\varphi}$, $\dot{e}_{zz}$ are volume deformation velocities, $\dot{e}_{r\varphi}$, $\dot{e}_{\varphi z}$, $\dot{e}_{zr}$ are shear deformation velocities. For the present conditions, (2) and (3) reduce to (4) and (5) with the effective viscosity in complex shear, axial shear and circumferential shear given by (6), (7) and (8), respectively. The shear stresses for pure-axial shear τ_1 and pure circumferential shear τ_2 are given by the first equations, p 67, where Δp is the difference in pressure between the ends of the annular space,

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H and L are the width and length of the space, M is the twisting moment, R_1 and R_2 are respectively the external and internal radii of the cylinders ($H = R_1 - R_2$). The mean deformation velocities in axial shear D_{10} and circumferential shear D_2 are found from the second equation, p 67, and the axial deformation velocity at the wall from the third equation, where Q is the outflow per second, ω the angular velocity of the rotor. Figs2 and 3 show log η_1 log η_2 and log η_i plotted against log D_1, log D_2 and log D_i for the extract. [Fig 2. Dependence of effective viscosity (axial, circumferential and spiral flow) on velocity gradient and intensity of deformation velocity for the extract] and for the grease [Fig 3. Dependence of effective viscosity (axial, circumferential and spiral flow) on velocity gradient and intensity of deformation velocity for lubricant grease]. The key to the figures on the diagrams is at the foot of p 67. In Fig 3 $\eta_1(D_1)$ is represented by the continuous line and $\eta_i(D_i)$ by the dotted $\eta_2(D_2)$ by the dashed-dotted line, line. The lines in Fig 2 are all parallel to the log D

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axis, and, for a given temperature, the points corresponding to different conditions all lie on the same line. Thus the effective viscosity of the residual extract is constant, and the superposition principle applies. Fig 3 shows that the effective viscosity of the lubricant grease falls with increasing deformation velocity. At 20° and 50° the effective viscosity for axial shear is rather greater than for circumferential shear. The differences may be interpreted as a breaking down of the structure of the grease and the orientation of the soap micro-filaments. The motion of the particles in spiral flow is determined by the equations at the foot of p 68 and the top of p 69, and Fig 4 shows the dimensionless viscosity η_i/η_2 plotted against the dimensionless length of the trajectory. [Fig 4 Dependence of the dimensionless viscosity η_i/η_2 on S/L for grease at 20° and 50°.] Within the limits of experimental accuracy (5 to 10%) the points lie on the same line for both temperatures, and the effective viscosity is a function not only of the intensity of

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deformation velocity, but also of the dimensionless quantity characterising the trajectories of the particles. Thanks are expressed to V. P. Pavlov for participating in the discussion of results, and for valuable advice. There are 4 figures and 10 references, 8 of which are Soviet, 1 English and 1 German.

SUBMITTED: June 4, 1959

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S/179/60/000/03/014/039
E191/E481

15.6000

AUTHORS: Vinogradov, G.V. and Vishnyakov, V.A. (Moscow)

TITLE: Abrasive Wear in Rolling Friction

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Mekhanika i mashinostroyeniye, 1960, Nr 3, pp 89-98 (USSR)

ABSTRACT: A four ball friction machine was used in the experimental study of the laws of abrasive wear of hardened steel with different lubricants under rolling friction at high contact pressures. The three lower balls remained free to roll along the groove of the supporting cup. The rolling speed of the lower balls was varied between 0.03 and 0.60 m/sec. The Hertz contact stress could reach 50000 kg/cm^2. A constant temperature of the lubricant was maintained. A high viscosity oil containing an additive with surface activity, a high viscosity non-polar oil, a low viscosity oil with 1% oleic acid, a low viscosity non-polar liquid (Cetane) and plastic lubricants, were used. Quartz dust with a micro-hardness of about 1000 kg/cm^2 served as an abrasive with particle sizes between 6 and 40 microns. By measuring the electrical resistance across the bearing

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model, the conditions of lubrication were detected. With the help of a special contact in the supporting cup, the rpm of the upper ball and the rolling speed of each of the lower balls were recorded. Parallel tests were carried out with an actual ball-bearing which showed that conditions in the model were similar. The balls roll over an abrasive layer which constitutes a mixture of lubricant with abrasive. Each factor was varied singly for each set of tests. A repeatability of 10% was established. It was found that the abrasive particles are ground in the wear process down to a size equal to the depth of the projections of the rolling surfaces plus the thickness of the lubricating layer. In low viscosity liquids, a sedimentation process of the abrasive particles takes place so that the largest are deposited at the bottom of the cup outside the rolling track. Thus wear is smaller in spindle oil than in grease, although the grease possesses better lubricating properties. Lubricants thickened by the addition of high molecular weight polymers experienced in the friction machine a reduction of viscosity which shows the disintegration of

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Abrasive Wear in Rolling Friction

the polymer presumably by very high gradients of the shear velocity. The same phenomenon has been found in gearboxes. Parallel tests with a pulley mounted on ball and roller bearings were carried out to show similar laws of abrasive wear. There are 10 figures, 1 table and 6 references, 5 of which are Soviet and 1 English.

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S/152/60/000/006/001/001
B024/B076

AUTHORS: Vinogradov, G. V., Arkharova, V. V., Bezborod'ko, M. D.

TITLE: Antiwear and Antifriction Properties of Structural Group Fractions of Mineral Oils

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Neft' i gaz, 1960, No. 6, pp. 81-87

TEXT: The authors investigated how far the nature of the structural group fractions of mineral oils affects their antiwear and antifriction properties in the presence of oxidizing gas media. Already in previous short time tests in the open, under seizure load conditions, with a number of low viscosity mineral oils as well as with naphthene-paraffinic fractions an oxidizing of the hydrocarbon medium was ascertained (Ref. 4). Also the tests with various naphthene-paraffinic fractions in O_2 medium (Ref. 5) showed that the oxidation process between steel and hydrocarbons retards or interrupts the seizure of friction surfaces. The main purpose of the present work is to ascertain, according to the results of the above

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mentioned open air tests (Refs. 1-6), what influence the fractional composition of mineral oils of various origins as well as the nature of gas media exercise on the wear and friction of steel. Numerous hydrocarbon fractions were tested and the mineral oils were classified in structural groups according to the methods published before (Refs. 7-9). A series of fractions were made available by M. S Borovaya. The tests were made on the four-ball machine; all samples tested are included in Tables 1 and 2, and the particularly typical cases are represented in Figs. 1 and 2. (Ref. 7). In respect of the naphthene-paraffinic fractions a quality analysis of two oil grades (Refs. 11,12) was made before and after the tests in order to ascertain the nature of the oxidation products. The comparison of various test results with the previous ones shows that the total sulphur content of mineral oils is in no way characteristic of their antiwear and antifriction properties. On the basis of tests with oxidizing gas media it was ascertained that the nature of structural group fractions of mineral oils was not of importance for their antiwear and antifriction properties. Oxygen has an influence similar to that of sulphur compounds active in relation to steel in the presence of which the wear increases at low loads and decreases at high loads. There are 2

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Antiwear and Antifriction Properties of Structural Group Fractions of Mineral Oils

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B024/B076

figures, 2 tables, and 12 Soviet references.

ASSOCIATION: Voyennaya ordena Lenina akademiya bronetankovykh voysk im. I. V Stalina (Order of Lenin Military Academy of Armoured Troops imeni I. V. Stalin)

SUBMITTED: December 19, 1959

Card 3/3

83687

S/152/60/000/008/004/004
B013/B054

15.6400

AUTHORS: Vinogradov, G. V., Arkharova, V. V.

TITLE: Wear-resisting and Antifriction Properties of Tetralin- and Decalin Homologs

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Neft' i gaz, 1960, No. 8, pp. 65 - 72

TEXT: In the present paper, the authors describe experiments with Tetralin- and Decalin homologs, and study their solutions with dibenzyl disulfide content in a concentration of 0.1 mole/l (dibenzyl disulfide - melting point 70.5°C, sulfur content 25.9%). The polycyclic Tetralin- and Decalin homologs used for experimental purposes were synthesized according to Ref. 5. The hydrocarbons synthesized represented isomer mixtures which, for simplification, are called cyclohexyl Tetralin, dicyclohexyl Tetralin, cyclohexyl Decalin, and dicyclohexyl Decalin. Their characteristics are given in Table 1. Figs. 1 and 2 show the results obtained from experiments with dicyclohexyl Tetralin and cyclohexyl Decalin as well as their solutions with dibenzyl disulfide. The

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83687

Wear-resisting and Antifriction Properties of Tetralin- and Decalin Homologs

S/152/60/000/008/004/004
B013/B054

wear-resisting properties of cyclohexyl Tetralin are described in Ref. 7. This substance and its solutions with dibenzyl disulfide behave similarly as is shown in Fig. 2. Dicyclohexyl Decalin and its solutions with dibenzyl disulfide have a wear resistance similar to that of dicyclohexyl Tetralin shown in Fig. 1. Table 2 gives the experimental loads. Fig. 3 shows the time dependence of the friction coefficients. Fig. 4 shows the specific loads after one-minute experiments as a function of the axial loads for some very typical cases. On the basis of their experiments, the authors found that an increase in the oxidative activity of the gas medium increases the chemical (oxidative) wear and the jamming loads, and reduces and degenerates the jam. In hydrocarbon media, molecular oxygen acts like an antifriction admixture. Molecular oxygen and sulfurous antifriction admixtures increase their activity mutually. There are 4 figures, 2 tables, and 7 Soviet references.

ASSOCIATION: Voyennaya ordena Lenina akademiya bronetankovykh voysk im I. V. Stalina (Military "Order of Lenin" Academy of the Armored Troops imeni I. V. Stalin)

SUBMITTED: January 25, 1960

Card 2/2

VINOGRADOV, G.V.; ARKHAROVA, V.V.

Basic characteristics of antiwear and antifrictional properties of hydrocarbons subjected to heavy friction. Khim.i tekh.topl.i masel 5 no.5:45-49 My '60. (MIRA 13:7)
(Hydrocarbons) (Friction)

DEYNEGA, Yu.F.; DUMANSKIY, A.V.; VINOGRADOV, G.V.; PAVLOV, V.P.

Dielectric and rheological properties of disperse plastic systems. Koll.zhur. 22 no.1:16-22 Ja-F '60. (MIRA 13:6)

1. Institut obshchey i neorganicheskoy khimii AN USSR, Kiyev.
(Oils and fats)

85707

S/069/60/022/004/004/005/XX
B003/B056

54400 1274, 1333, 1263

AUTHORS: Osokina, D. N., Gzovskiy, M. V., Vinogradov, G. V., and Pavlov, V. P.

TITLE: Investigation of the Processes of Plastic Deformation by Means of Ethylcellulose Solutions and Gels and Optical Polarization

PERIODICAL: Kolloidnyy zhurnal, 1960, Vol. 22, No. 4, pp. 434-442

TEXT: The investigations described in the present paper deal with the problem as to whether it is, in principle, possible to study shear stress and rate of deformation in plastically deformable soft bodies by the method of optical polarization. The results obtained may be usefully applied in the mechanics of disperse systems, of tectonic physics, etc. The measurements were carried out in a device designed by V. P. Pavlov (Ref. 13) and constructed by the Institut fiziki Zemli AN SSSR (Institute of Geophysics of the AS USSR), which simultaneously, fulfilled the function of a plastoviscosimeter and a dynamooptimeter. The device schemat-

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Investigation of the Processes of Plastic Deformation by Means of Ethylcellulose Solutions and Gels and Optical Polarization

S/069/60/022/004/004/005/XX
B003/B056

ically shown in Fig. 1 and described in detail in the original paper contains, among other things, a KCП-5 polariscope (KSP-5), as well as a Berek compensator for measuring the optical effect. The dependence of shear stress on deformation as well as the deformation-kinetic diagrams were ascertained with the help of Pavlov's elastoplastoviscosimeter (Ref. 14). The material used was Soviet ethylcellulose of the type K-290 (K-290) with a molecular weight of $7.7 \cdot 10^4$ and a substitution degree of 46.25%. The viscosity of a 5% alcohol benzene solution was ~290 centipoise at 20°C. The ethyl cellulose was used in a dissolved state in benzyl alcohol (of different concentrations) and/or in benzyl alcohol dibutylphthalate mixtures (whose mixing ratio was varied in a 30% concentration). The measured results are shown in the diagrams of Figs. 2 - 5. The modulus of shear of the ethyl cellulose solutions was between 0.01 and 1 kg/cm^2, the viscosity between 10^2 and 10^7 poise. Owing to their mechanical properties, the solutions in benzyl alcohol corresponded to highly viscous Newton liquids having a completely linear dependence of

Investigation of the Processes of Plastic Deformation by Means of Ethylcellulose Solutions and Gels and Optical Polarization

S/069/60/022/004/004/005/XX
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the birefringence (Δn) both on the shear stress as also on the deformation rate. The solutions containing dibutylphthalate acquired plastical consistence with an increase in the dibutylphthalate content. The aforementioned dependences are, in this case, not linear but exponential. The coefficient of optical activity V_τ ($V_\tau = \Delta n/\tau$; Δn - amount of the double refraction of light, τ - shear stress) is in the case of 10 to 35% ethyl cellulose solutions practically independent of the concentration, and is between $5\text{-}7.10^4$ Brewster. V_τ decreases with an increasing dibutylphthalate content in the mixture, as well as with decreasing temperature. Among others, a paper by G. V. Vinogradov and V. N. Manin is mentioned. There are 5 figures, 1 table, and 13 references: 11 Soviet, 1 US, and 1 German.

ASSOCIATION: Institut fiziki emli im. O. Yu. Shmidta Moskva (Institute of Geophysics imeni O. Yu. Shmidt, Moscow)

SUBMITTED: April 19, 1959

Card 3/3

MDIVNISHVILI, O.M.; VINOGRADOV, G.V.; GOL'DIN, S.A.

Structure formation in suspensions of askangel and its derivatives. Koll. zhur. 22 no. 5:606-610 S-O '60. (MIRA 13:10)

1. Kavkazskiy institut mineral'nogo syr'ya, Tbilisi. (Askangel)

DEYNEGA, Yu.F.; PAVLOV, V.P.; VINOGRADOV, G.V.

Instrument for a simultaneous study of dielectric and rheological properties of viscoplastic materials. Zav.lab. 26 no.3:353-356 '60. (MIRA 13:6)

1. Institut obshchey i neorganicheskoy khimii Akademii nauk USSR.
(Materials--Electric properties)
(Rheology)

L 20337-63 EPF(c)/EWT(m)/BDS AFFTC/APGC Pr-4 EW/WW/DJ
S/2664/61/000/000/0197/0206

ACCESSION NR: AT3001990

AUTHOR: Vinogradov, G. V.

TITLE: The mechanism of the action of additives. New methods and results of an investigation of antiwear and antifriction properties of lubricating materials.

SOURCE: Prisadki k maslam i toplivam; trudy nauchno-tekhnicheskogo soveshchaniya. Moscow, Gostoptekhizdat, 1961, 197-206.

TOPIC TAGS: lubricant, lubrication, additive, oil, friction, wear, antiwear, oxidation, oxidation product, product, O, seizure, antiseizure, seizing, boundary lubrication, coefficient, boundary layer, naphthene, paraffine.

ABSTRACT: The paper describes an experimental test series intended to reveal whether or not the behavior of petroleum products under the stringent demands of boundary lubrication is primarily determined by conjoint oxidation reactions of the hydrocarbons and the steel. This would, in essence, contradict the present trend of thinking which implies that the oil is merely a carrier of additives which, through their surface activity, are adsorbed at the metal-oil boundary and are the actual source of lubrication. A new high-temperature vacuum friction-testing machine, MT-4, designed by V. I. Drandin and A. A. Konstantinov, is described.

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ACCESSION NR: AT3001990

The tests comprised the dependence of the kinetic-friction coefficient on the axial loads in the naphthene-paraffine fraction of the MS-20 oil. The friction-vs.-time relationship at loads both below and above seizure value, and a repetition of the same tests for other oils, are described. Conclusions: (1) In the absence of O and O-containing compounds, hydrocarbon (petroleum) oils are ineffective or little-effective lubricants under boundary lubrication. (2) O and oxidation products held in solution in petroleum oils exert a highly important natural-additive effect against the seizure of steel under boundary lubrication. Even traces are effective. (3) With increasing loads on a friction couple, the relative effectiveness of boundary layers formed by organic compounds (soaps, etc.) decreases, and the effect of oxide layers increases. (4) As the oxidation process is intensified, the static friction and oxidational wear grow, but at the same time the seizing process degenerates, occurring only for short times and with relatively small increases in friction coefficient, and high-intensity seizure occurs only at very high contact stresses. Thus, every friction regime requires a specific optimal concentration of oxidants and values of the intensity of the oxidation process. (5) Since the petroleum oils serve as the carriers of O toward the steel surface, the transport conditions of the molecules of the O and the oxidation products, that is, the viscosity of the liquid lubricant, the thickness of the lubricant film, etc., are of great significance. (6) The O and oxidation products of petroleum oils act in a manner similar to that

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of S-organic compounds that are used as antiseizure additives to oils. O-rich chemical organic compounds should exert a powerful antiseizure action in the frictional wear of steels. Orig. art. has 5 figures.

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Institute of Petrochemical Synthesis, AS USSR).

SUBMITTED:	00	DATE ACQ:	23Jan63	ENCL:	00
SUB CODE:	FL, CH, EL	NO REF SOV:	000	OTHER:	000

Card 3/3

89936
S/030/61/000/001/005/017
B105/B206

15.6000 1583, 1404

AUTHOR: Vinogradov, G. V., Doctor of Chemical Sciences

TITLE: New ways for testing lubricants

PERIODICAL: Vestnik Akademii nauk SSSR, no. 1, 1961, 48-53

TEXT: The following co-authors of this study are named: Ye. I. Gurovich, N. K. Voskresenskaya (Institut obshchey i neorganicheskoy khimii Akademii nauk SSSR (Institute of General and Inorganic Chemistry of the Academy of Sciences USSR)), N. T. Pavlovskaya, Lyan Go-lin', Yu. Ya. Podol'skiy, A. A. Konstantinov, and M. D. Bezborod'ko (Institut neftekhimicheskogo sinteza Akademii nauk SSSR (Institute of Petrochemical Synthesis of the Academy of Sciences USSR)). The apparatus MT-4 (MT-4) and MT-6 (MT-6) were designed at the Institute of Petrochemical Synthesis of the Academy of Sciences USSR for studying the effect and mode of action of the lubricants under conditions of rolling and sliding friction. These types of friction could be studied by means of these apparatus at temperatures of up to 800°C in the air, the presence of various gases as well as in high vacuum. The rotary speed of one

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New ways for testing lubricants

friction face can be varied between $1.5 \cdot 10^{-4}$ and 3200 rpm and the load on the friction face from 5 to 500 kg. This allows the conduction of experiments at contact pressures of from some kg/cm^2 up to $5 \cdot 10^4$ kg/cm^2. Fig. 1A shows the basic diagram of the installation. The friction mechanism is shown in cross section in Fig. 1Б. The temperature of the lubricants is controlled and recorded in the range of high temperatures by means of an electric potentiometer of the type ЭПВ12-2Т (EPV12-2T). A cathode oscilloscope of the type ЭРУ (ERU) is also used. Important data were obtained in experiments with the widely used naphtha lubricants. The experiments were conducted with balls made from steel of the type ЭИ347 (EI347) as well as hardened steel of the type ШХ9 (ShKh9). Fig. 2 shows that oxygen has a very strong effect on steel corrosion in the presence of naphtha lubricants. It was discovered previously that some liquid metals proved as being good wear-preventing agents for the friction of hardened steels. Experiments with balls from steel of the type EI347 were conducted in this connection, Wood's alloy as well as the eutectic $SnCl_2$-KCl, which melts at 224°C, having been selected as sample lubricants. The experimental results are shown in Fig. 3.

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S/030/61/000/001/005/017
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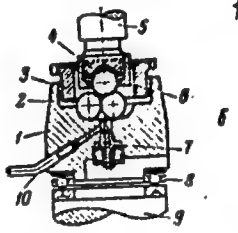
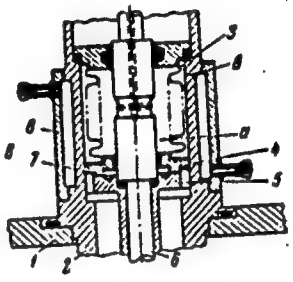
New ways for testing lubricants

Comprehensive studies of the lubricants show that the effectiveness of their application for the purpose of reducing wear and friction under severe conditions is determined by the existence of components in these lubricants which can modify the friction face chemically. Of great importance is also the standardization of this activity by means of selecting suitable concentrations of components, the composition of the gas phase as well as the conditions of supplying chemically active agents to the friction zones. The efficiency of various lubricants may still be greatly increased. There are 3 figures and 3 Soviet-bloc references.

Fig. 1





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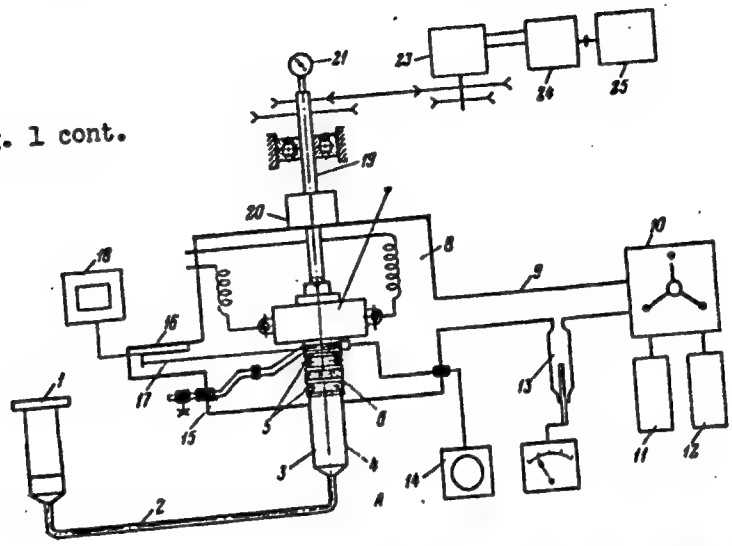
S/030/61/000/001/005/017
B105/B206

New ways for testing lubricants

Fig. 1 cont.



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S/030/61/000/001/005/017
B105/B206

New ways for testing lubricants

Legend to Fig. 1A. Basic diagram of a friction testing machine for tests at high temperatures in high vacuum, in gas media of various nature. 1) piston type manometer, 2) pipe line, 3) floating piston, 4) load chamber, 5) ball bearing, 6) heat-insulation disc, 7) radiation furnace, 8) hermetically sealed chamber, 9) pipe line, 10) multiple cock, 11) and 12) vacuum pumps, 13) vacuum gage, 14) potentiometer of the type EMB12-2T (EPV12-2T), 15) teflon pipe, 16) holder for the tensiometers, 17) tie rod, 18) recording device with ERU oscilloscope, 19) spindle, 20) bellows-sealed device, 21) electrotachometer, 23) hydromotor, 24) hydraulic pump, 25) electromotor.

Legend to Fig. 1B. 1) trough, 2) three balls, lockable by nut (3), 4) rotating ball on spindle (5) and nut (6), 7) bushing for thermocouple, 8) ball bearing, 9) heat-insulating disc, 10) pressed-in gas-feed pipe.

Legend to Fig. 1B. 1) chamber, 2) trough, 4) bronze ring, 5) trough, 6) spindle, 7) ring, 8) water jacket.

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S/030/61/000/001/005/017
B105/B206

New ways for testing lubricants

Legend to Fig. 2. The dynamic coefficient of friction as a function of the loads. 1) high vacuum, 2) argon, 3) air, 4) bubbling of O_2 through the lubricant.

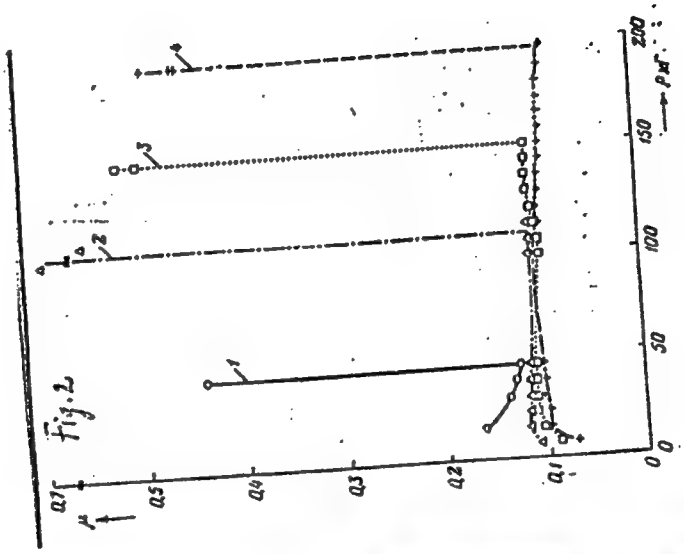

Fig. 2

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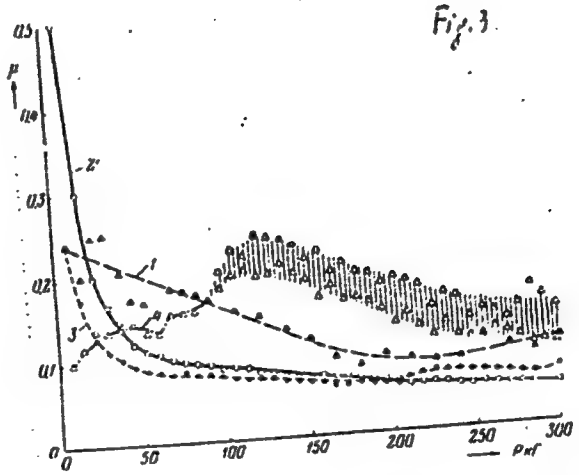
B105/B206

New ways for testing lubricants

Legend to Fig. 3. The dynamic coefficient of friction as a function of the loads for tests with Wood's alloy as well as low-melting eutectic of salts.
1) Wood's alloy at 200°C in high vacuum,
2) eutectic KCl + $SnCl_2$ at 300°C in high vacuum,
3) ditto in air,
4) powdery eutectic at room temperature.

Fig. 3



Card 7/7

88831

S/152/61/000/001/001/007
B023/B064

5.3300

AUTHORS: Vinogradov, G. V., Arkharova, V. V., Podol'skiy, Yu. Ya.

TITLE: Wear resistance and antifriction properties of alkylated aromatic hydrocarbons

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Neft' i gaz, no. 1, 1961, 61-65

TEXT: In continuation of their previous papers and published data, respectively (Refs. 1-3 and 10-13), the authors studied the antiwear- and antifriction properties of bicyclic aromatic hydrocarbons. A mixture of isomers of triisoamyl naphthalene was chosen as hydrocarbon. The investigations were carried out on a friction test machine with four balls which was described in the paper of Ref. 15. The balls consisted of ШХ6 (ShKh6) steel with a diameter of 12.7 mm. The gliding velocity was 23 cm/sec, the temperature 100°C. The experiments were conducted in air and in Ar- and O_2 atmosphere. Dibenzyl disulfide was used as antiwear admixture in a concentration of 0.1 mole/l. The curves of wear as a function of load showed two stages for triisoamyl naphthalene in all gas media applied. A table

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shows the values of the lower critical loads P'_k (on the lower stage) and the higher (P''_k on the upper stage) at which a more or less jumpwise increase of wear occurs due to an intensive gripping. In the authors' opinion the increase of the oxidizing activity of the gas medium leads to the increase of P', to the increase of wear at $P < P'$, and to a considerable reduction of wear at $P > P_k$. The experiments with the dibenzyl sulfide solution showed, in agreement with previous publications, that the disulfide sulfur introduced into the hydrocarbon has the same effect as O_2. At lower loads, the presence of sulfur, like the presence of O_2, leads to an increase, but at high loads to a reduction of wear. Reduction is especially great when O_2 is intensively introduced into the zones of friction. The increase in the oxidizing activity of the gas medium leads to a reduction of the gripping process. The introduction of the sulfurous admixture which is active toward steel, eliminates vehement gripping. At experiments made in O_2 atmosphere, the values of the friction coefficients at the end of the 1-minute experiments did not depend on the loads perpendicular to the axis. The curves p(P) for solutions of dibenzyl sulfide show, like the curves wear - load and the friction diagrams, that sulfur,

at friction under high specific loads acts analogously to O_2, and that each of these agents increases the effect of the other. In conclusion, the authors summarize as follows: The antiwear- and antifriction properties of the alkylated bicyclic hydrocarbons at difficult conditions of friction do not differ qualitatively from what is known about naphthene-paraffine and low-sulfuric aromatic fractions of mineral oils. These properties depend on the intensity of the course of conjugate oxidation reactions of hydrocarbon lubricating media and steel. Molecular oxygen is an active anti-aggressive admixture. Its effect increases the effect of disulfide sulfur and vice versa. K. I. Klimov and G. I. Kichkin are mentioned. There are 4 figures, 1 table, and 15 Soviet-bloc references.

ASSOCIATION: Voyennaya akademiya bronetankovykh voysk im. I. V. Stalina (Military Academy of Armored Troops imeni I. V. Stalin)

SUBMITTED: July 25, 1960

88831

Wear resistance and antifriction... S/152/61/000/001/001/007
B023/B064

Legend to the Table: 1: denotation of the product; 2: Argon; 3: Air; 4: Oxygen; 5: Triisoamyl naphthalene; 6: Dto. + dibenzyl disulfide.

1 Наименование продукта	2 Аргон				3 Воздух				4 Кислород			
	$P'_к$	p'	$P''_к$	p''	$P'_к$	p'	$P''_к$	p''	$P'_к$	p'	$P''_к$	p''
5 Триизоамилнафталин	20	120	90	30	45	127	105	32	60	120	135	70
6 То же+дибензилдисульфид	—	—	—	—	30	130	—	—	60	100	—	—

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BEZBORODʹKO, M.D.; SHABAROV, L.I.; PODOLʹSKIY, Yu.Ya.; VINOGRADOV, G.V.

Instrument for investigating the wear resistance and antifriction properties of plastics. Zav.lab. no.1:104-106 '61. (MIRA 14:3)
(Plastics--Testing)

VINOGRADOV, G.V.; LYAN GO-LIN' [Liang Kuo-lin]; PAVLOVSKAYA, N.T.

Oxidants as a basis for the lubricating action of mineral oils. Neftekhimiia 1 no.2:274-279 Mr-Ap '61. (MIRA 15:2)

1. Institut neftekhimicheskogo sinteza AN SSSR.
(Mineral oils)
(Lubrication and lubricants)

VINOGRADOV, G.V.; LYAN GO-LIN' [Liang Kuo-lin]; PAVLOVSKAYA, N.T.

Higher aliphatic acids as additives to mineral oils for use in connection with high friction of metals; use of stearic acid. Neftekhimiia 1 no.2:280-285 Mr-Ap '61. (MIRA 15:2)

1. Institut neftekhimicheskogo sinteza AN SSSR.
(Lubrication and lubricants—Additives)
(Stearic acid)

39833

S/081/62/000/011/040/057
E202/E192

11.9700

AUTHORS: Vinogradov, G.V., Liang Kuo-lin, and Pavlovskaya, N.T.

TITLE: The influence of pro- and anti-oxidants on the lubricating action of petroleum oils

PERIODICAL: Referativnyy zhurnal, Khimiya, no.11, 1962, 520, abstract 11 M 216. (Neftekhimiya, v.1, no.3, 1961, 427-432).

TEXT: A 4-ball friction machine was employed using an earlier procedure (see R.Zh.Khim., 3, 1962, M218) to test paraffin fractions of petroleum oils (NF) which did not contain additives, and those containing 0.5% of benzyl peroxide (I) and 0.5% I + 2,6-tert-butyl-4-methylphenol (II; II as an anti-oxidant). The tests were carried out: 1) in vacuum at approximately 10^{-5} mm Hg (with NF distilled in vacuum and kept without contact with air); 2) by blowing O_2 through NF. The coefficient of friction was determined in relation to load and the seizure load (NZ). Introduction of I into NF caused considerable increase of NZ in the tests carried out in vacuum, in tests with the passage of argon, and in tests in air. In tests with the passage

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of O_2, introduction of I increased the coefficient of friction for loads lower than NZ and lowered considerably NZ; the seizure was, however, stopping rapidly during further increase of loads. Introduction of II (up to 10% concentration) into NF during the vacuum tests did not affect the results, and in tests in air and with the passage of oxygen (where a certain amount of seizure at increased loads was observed) did not influence the load causing initial seizures, but lowered the loads of the subsequent intensive seizures and the welding loads. It was concluded that II as an anti-oxidant retards the oxidation of the oil by preventing the accumulation in it of the active oxidants and thereby makes easier the appearance of intensive seizures.

[Abstractor's note: Complete translation.]

VINOGRADOV, G.V.; LYAN GO-LIN' [Liang Kuo-lin]; PODOL'SKIY, Yu.Ya.; SANIN, P.I.; SHEPELEVA, Ye.S.

Peculiarities of the joint action of air (molecular oxygen) and thio-, phosphorus- and chloroorganic compounds as additives to mineral oils of different viscosities. Neftekhimia 1 no.3:433-443 My-Je '61. (MIRA 16:11)

1. Institut neftekhimicheskogo sinteza AN SSSR.

VINOGRADOV, G.V.; ARKHAROVA, V.V.; PODOL'SKIY, Yu.Ya.

Antiwear and antifriction properties of alkylated aromatic hydrocarbons. Izv. vys. ucheb. zav.; neft' i gaz 4 no.1:61-65 '61. (MIRA 15:5)

1. Voyennaya akademiya bronetankovykh voysk imeni Stalina.
(Hydrocarbons)